

**THE HALOPHYTE TALES VOL I**

Illustrations by: Tyasseta & Siloy

# **THE RISE OF THE INCREDIBLE SALTY SALICORNIA POWER PLANT**



**JAN  
FRIESEN**

**SKANDER  
ELLEUCHE**





THE AGYA SCIENCE COMIC IS BASED ON THE ARTICLE:  
"FACING THE CHALLENGE OF SUSTAINABLE BIOENERGY PRODUCTION: COULD HALOPHYTES BE PART OF THE SOLUTION?"  
BY A. DEBEZ, I. BELGHITH, J. FRIESEN, C. MONTZKA, S. ELLEHCHE (2017)  
JOURNAL OF BIOLOGICAL ENGINEERING 11 : 27. DOI 10.1186/S13036-017-0069-0



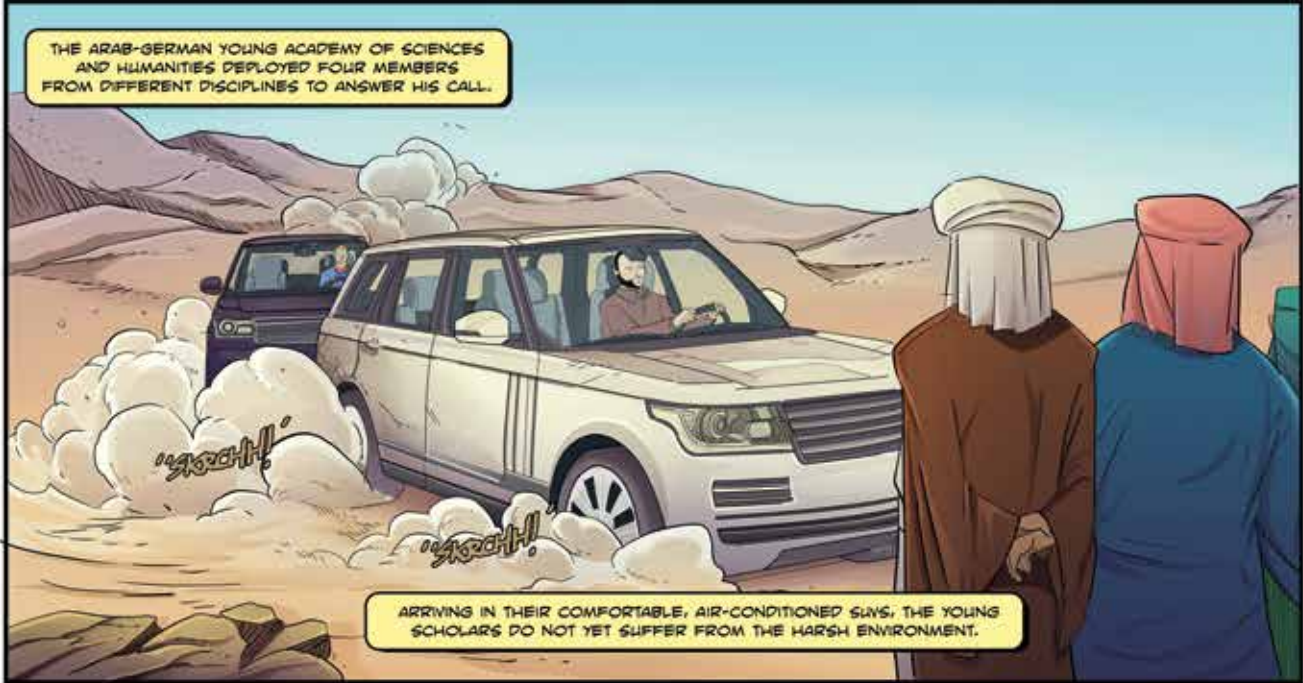
SOMEWHERE IN THE DESERT THE TEMPERATURE RISES ABOVE 40° UNDER A SCORCHING SUN.

NOT A BREEZE IS STIRRING. THE SUN IS BURNING AND EVEN THE TOUGHEST ANIMALS HIDE IN THE FEW SHADY CRACKS OR IN THE COLD DEPTHS OF THE SAND.



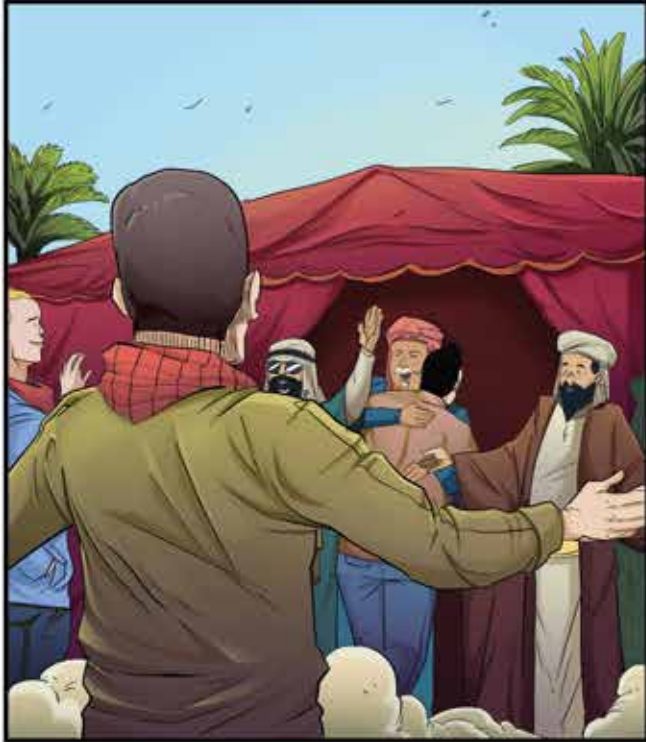
THE DESERT AND THE NEARBY HIGH-TECH MEGACITY IS RULED BY A GREAT AND BENEVOLENT SULTAN RICH IN PETROL AND GAS. HIS VISION IS TO ENTER A SUSTAINABLE ERA AFTER BUILDING HIS REALM FROM OIL AND GAS.

TO REALIZE THIS BRAVE AND SMART FUTURE, HE CALLED UPON YOUNG SCHOLARS TO DEVELOP PROMISING TECHNOLOGIES AND SOLUTIONS.



THE ARAB-GERMAN YOUNG ACADEMY OF SCIENCES AND HUMANITIES DEPLOYED FOUR MEMBERS FROM DIFFERENT DISCIPLINES TO ANSWER HIS CALL.

ARRIVING IN THEIR COMFORTABLE, AIR-CONDITIONED SUVs, THE YOUNG SCHOLARS DO NOT YET SUFFER FROM THE HARSH ENVIRONMENT.







THE SULTAN DID NOT SHRINK FROM THE COST AND TROUBLE, HAVING A LUXURIOUS MEAL PREPARED.



I HAVE A SPECIAL GIFT FOR YOU. WHENEVER DISCIPLINARY LITERACY HAMPER'S YOUR PROGRESS, THE SCIENCE JINN WILL APPEAR AND TRANSLATE YOUR TECHNICAL TALK INTO UNDERSTANDABLE WORDS.

BY THE WAY I HOPE YOU ENJOY THE DELICIOUS UMM ALI PREPARED BY MY MOTHER-IN-LAW.



WHEW EVEN THE LEAVES ARE SALTY!

COOL, THEY PREPARED THE SALAD WITH *SALICORNIA PERENNANS*.

?



*Salicornia perennans* is the scientific name for 'sea beans'

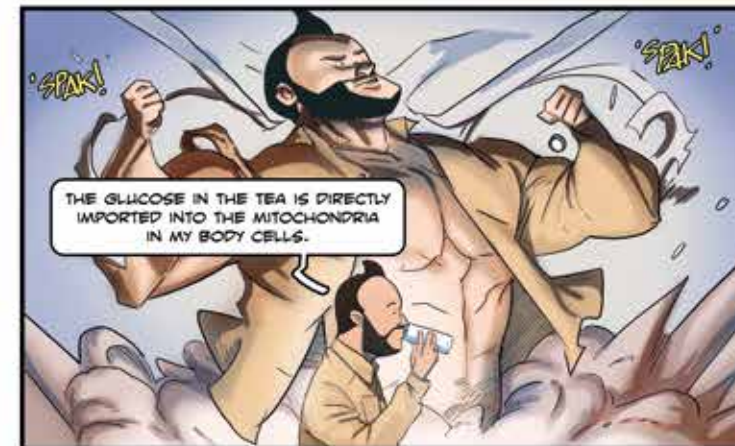
- Salt tolerant plants are called 'halophytes'
- Survival artists
- Grow on salty soil
- Grow in harsh conditions



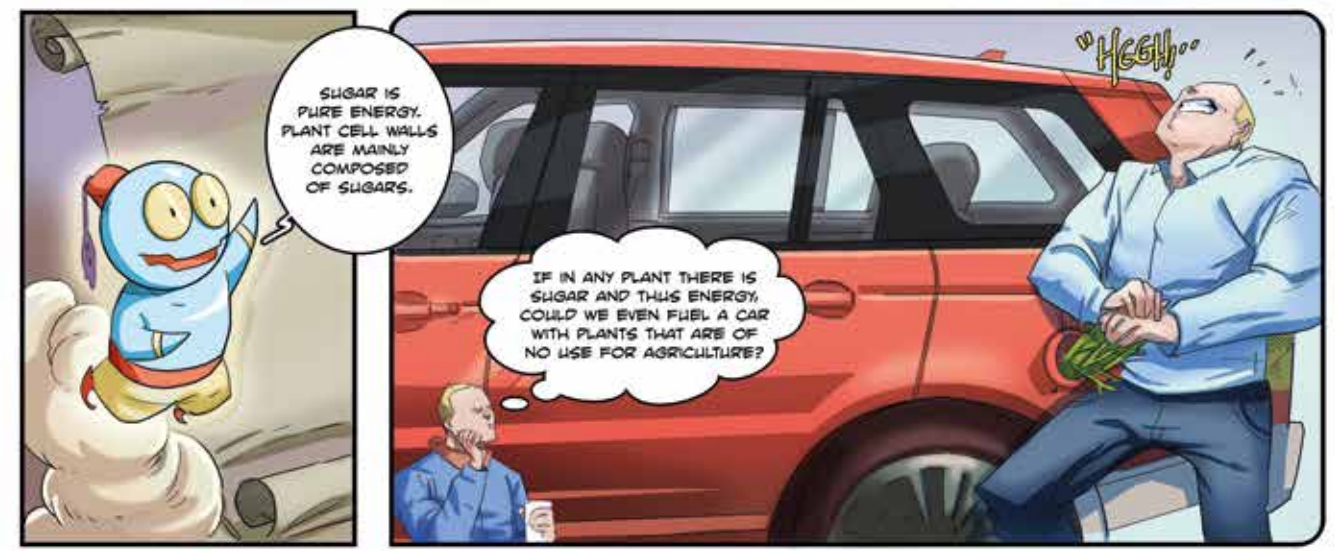
HALOPHYTES THRIVE IN SALTY HABITATS.



FULL FROM THE SUMPTUOUS FEAST, THEY ENJOY THE SWEET MINT TEA.



THE GLUCOSE IN THE TEA IS DIRECTLY IMPORTED INTO THE MITOCHONDRIA IN MY BODY CELLS.



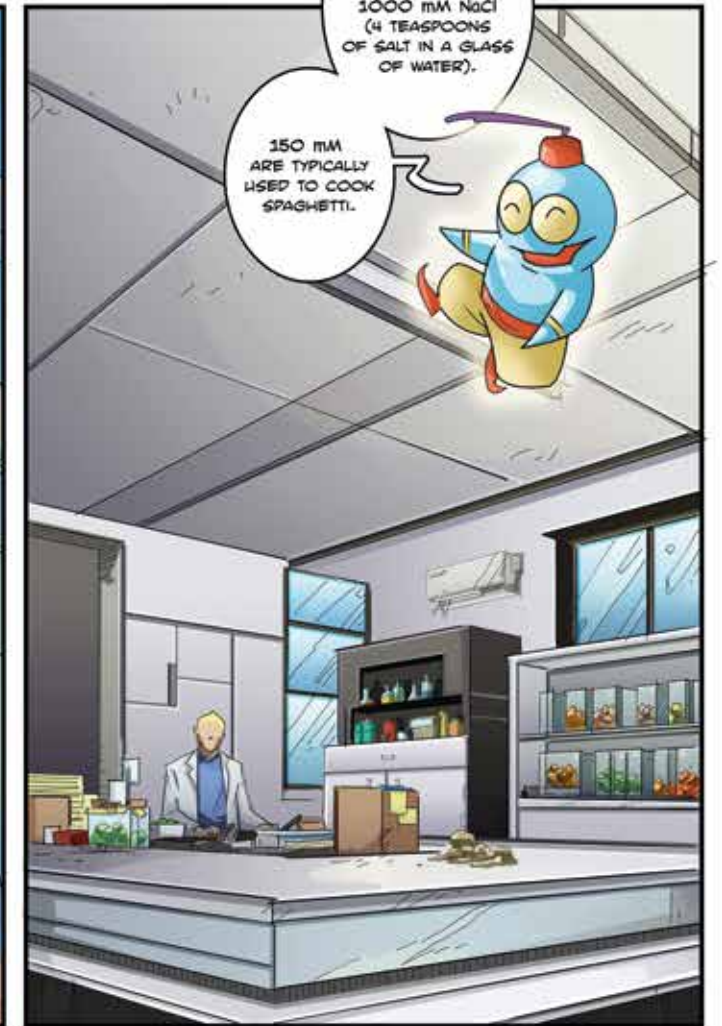
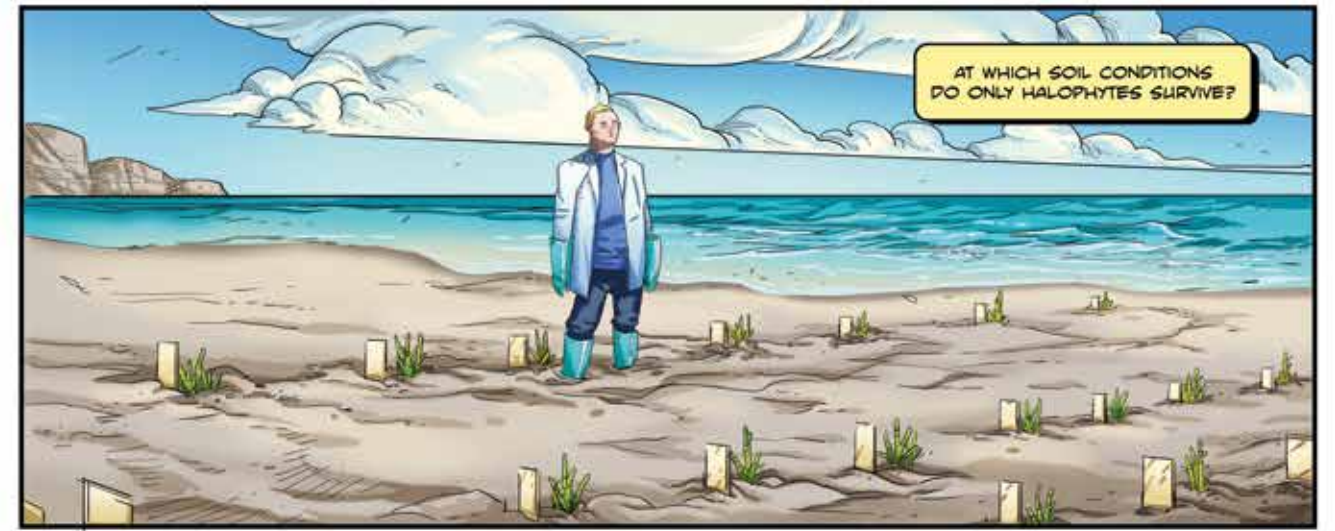
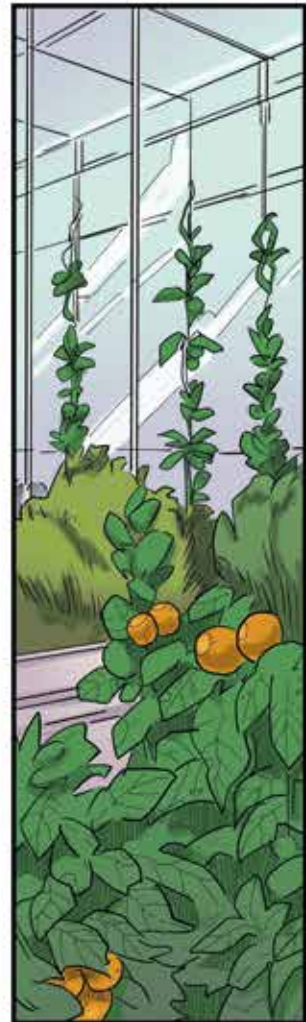
SUGAR IS PURE ENERGY. PLANT CELL WALLS ARE MAINLY COMPOSED OF SUGARS.

IF IN ANY PLANT THERE IS SUGAR AND THUS ENERGY, COULD WE EVEN FUEL A CAR WITH PLANTS THAT ARE OF NO USE FOR AGRICULTURE?

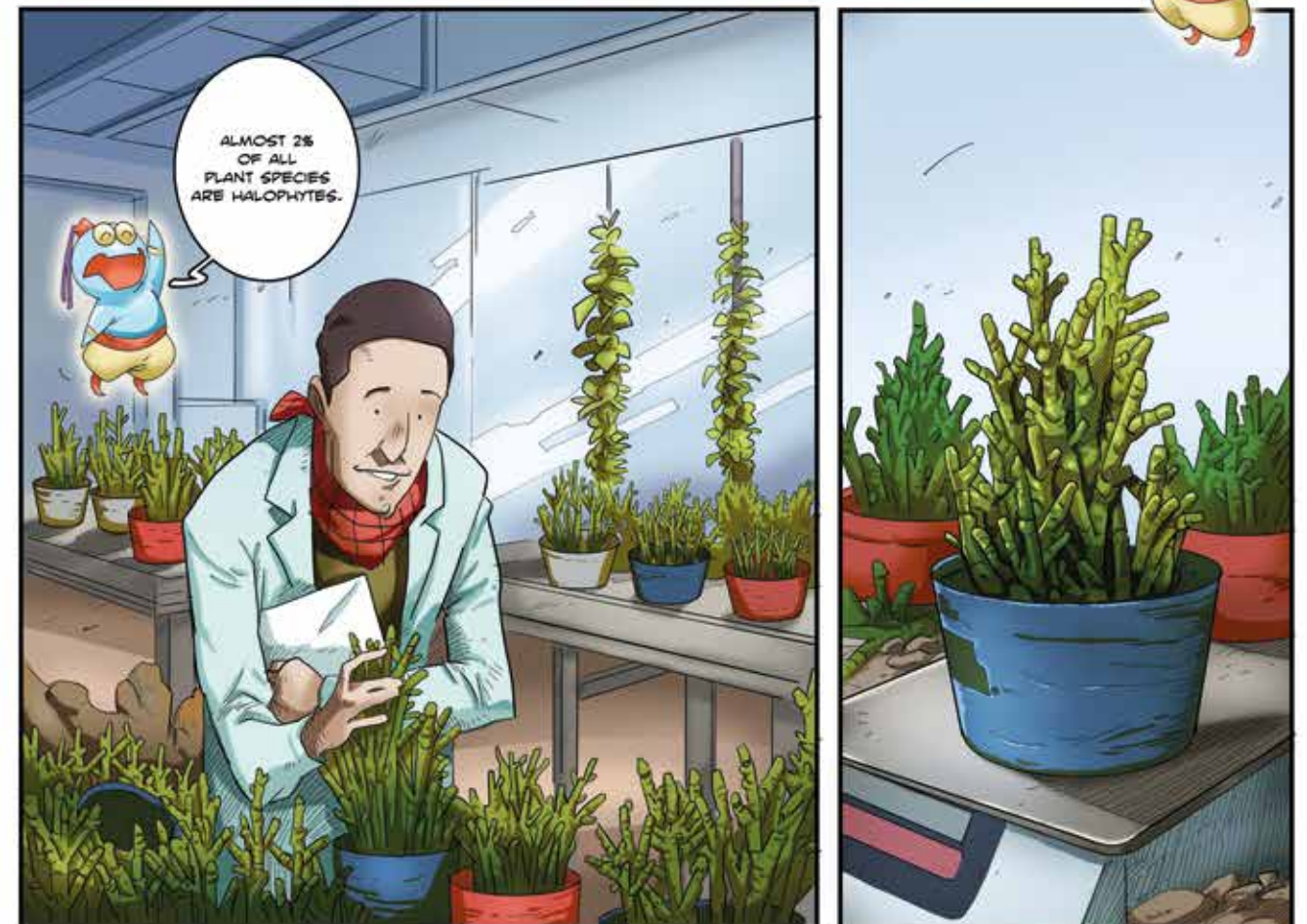
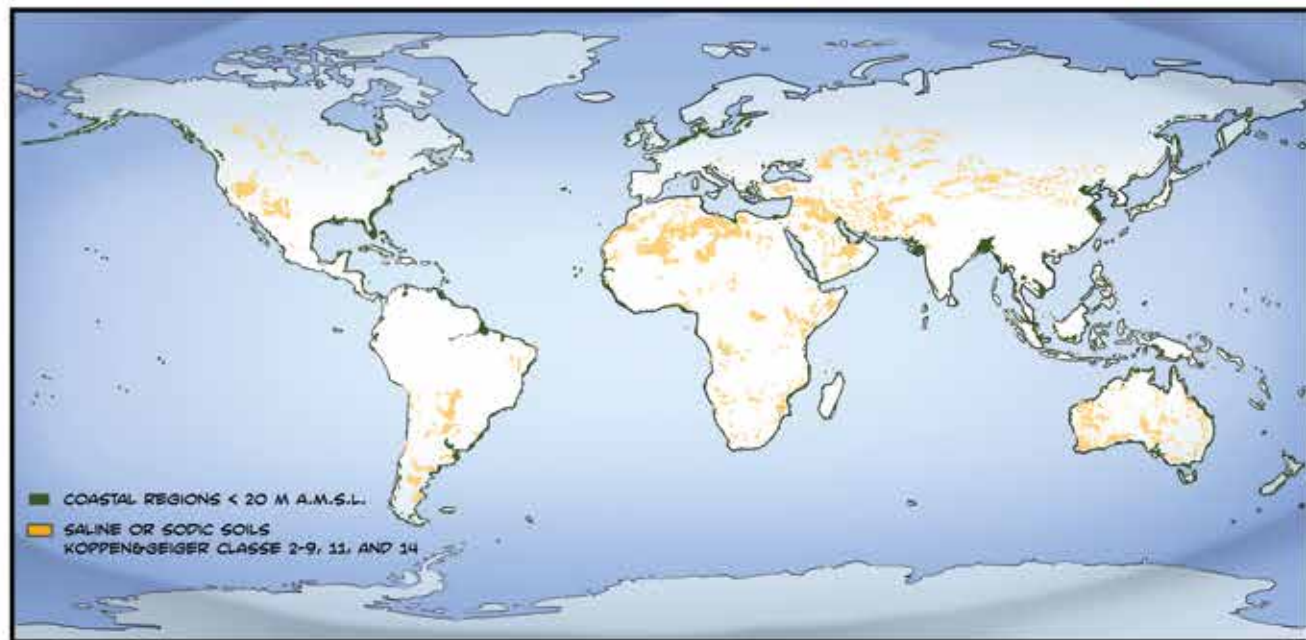


CAN HALOPHYTES FUEL THE WORLD?

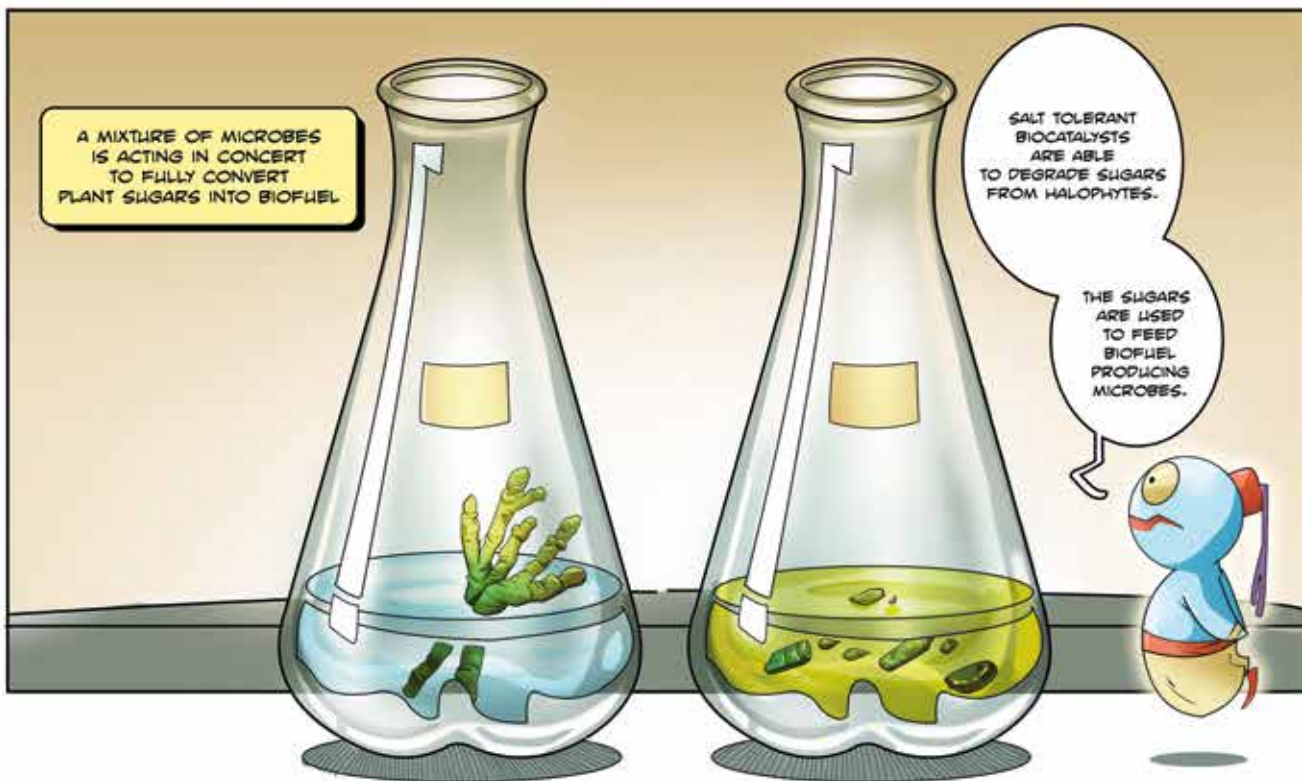
















TO BE CONTINUED...



### The soil scientist

**CARSTEN** IS AN EXPERT IN SOIL SCIENCES AND REMOTE SENSING WORKING IN JUELICH, GERMANY. HE INVESTIGATES HOW SOIL MOISTURE CAN BE ESTIMATED BY SATELLITES. HE LIKES BEING IN THE FIELD TO CHECK AT GROUND WHAT HE SEES FROM SPACE.



### The eco-hydrologist

**JAN** STUDIED PHYSICAL GEOGRAPHY AND WORKS IN LEIPZIG, GERMANY. JAN USES REMOTE SENSING DATA TO MAP FORESTS AND INVESTIGATES HOW FORESTS INTERACT WITH RAINFALL. HE LIKES TO PLAY WITH NEW SENSORS AND STARTED TO USE DRONES TO MAP GROUNDWATER DISCHARGE.



### The plant biologist

**AHMED** STUDIED PLANT BIOLOGY AND WORKS IN TUNIS, TUNISIA. HE INVESTIGATES THE PHYSIOLOGY OF SALT LOVING PLANTS IN SALINE ENVIRONMENTS. AT THE MOMENT HE IS STILL WAITING FOR HIS PLANE TO BE FUELED TO GET BACK HOME.



### The biotechnologist

**SKANDER** WAS TRAINED AS A MICROBIOLOGIST AND WORKS IN BERGISCH GLADBACH, GERMANY. SKANDER INVESTIGATES ENZYMES TO BE USED FOR INDUSTRIAL APPLICATIONS. HE JUST FINISHED A POPULAR SCIENTIFIC BOOK ON MICROBES THRIVING IN THE HARSHTEST LOCATIONS ON THE PLANET, SUCH AS THE COOLEST DEEP SEA AND HOTTEST DESERTS.



### The Science Jinn

AN ANCIENT BEING THAT WAS INVOLVED IN THE CONSTRUCTION OF THE EIGHT WORLD WONDERS AND HELPED COMMUNICATE BETWEEN THE DISCIPLINES. HE CAN TRANSLATE ANY TECHNICAL AND SCIENTIFIC DETAILS INTO WORDS THAT CAN BE EASILY UNDERSTOOD BY EVERYONE. HE IS CURRENTLY AN ADVISOR FOR THE NEW BERLIN AIRPORT - BUT EVEN HIS POWERS ARE SOMETIMES LIMITED...



### The Mother-in-Law

SHE IS THE SULTAN'S MOTHER-IN-LAW AND PROVIDES FOOD FOR THE SCHOLARS. SHE CURRENTLY RUNS A START-UP THAT CATERES HALOPHYTE MENUS FOR LAUNCH EVENTS AND HAS RECENTLY PATENTED A HALOPHYTE POWERED OVEN.



### The Sultan

HE EVALUATES THE 2017 PUBLISHED REVIEW ARTICLE, ENTITLED "FACING THE CHALLENGE OF SUSTAINABLE BIOENERGY PRODUCTION: COULD HALOPHYTES BE PART OF THE SOLUTION?", PUBLISHED IN J. BIOL. ENG. 11(27) BY DEBEZ ET AL. AND PLANS TO IMPLEMENT SUSTAINABLE ENERGY ALTERNATIVES IN HIS REALM. HE CURRENTLY DREAMS OF THE WORLD'S FIRST HALOPHYTE POWER PLANT.



### The Halophyteman

SUPERHERO WHO MIGHT BE ABLE TO SOLVE THE WORLD'S ENERGY PROBLEMS. CHECK OUT THE FORTHCOMING EPISODES OF THE HALOPHYTE TALES.




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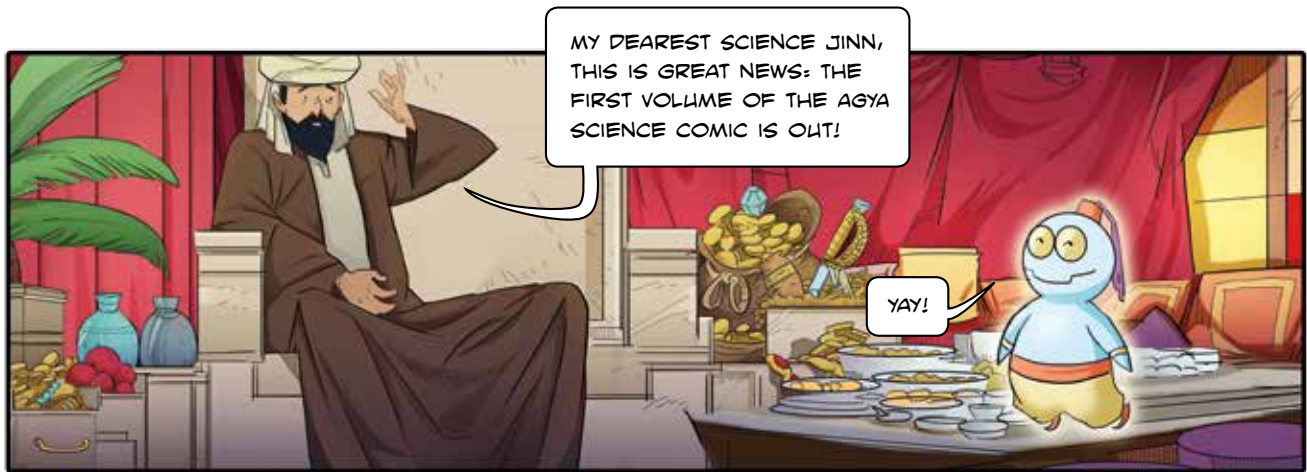
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# THE 1<sup>ST</sup> AGYA SCIENCE COMIC

THE AGYA SCIENCE JINN REVEALS HOW IT CAME ALL ABOUT...



**Science Jinn** – Your Majesty has called for me?!

**Sultan** – My dearest Science Jinn, what I hold here in my hands is the first volume of our AGYA comic series “The HALOPHYTE tales”.



**Science Jinn** – Our first science comic episode! Your Majesty knows how much I love science!

**Sultan** – Do you remember that I asked four outstanding young scholars from the Arab-German Young Academy of Sciences and Humanities (AGYA) to develop a concept of how to generate green energy from halophytes growing in hot, arid and salty environments?

**Science Jinn** – Is Your Majesty talking about the review article in which they explain how to identify halophytes, which are salt-loving plants and how to determine their growth behavior with regard to their nutrient requirements and soil conditions?!

**Sultan** – Indeed, they ...

**Science Jinn** – ...also mapped for Your Majesty the climate and potential arable lands, where these survival artists do not compete with edible food crops. Wheat and corn are usually not able to grow on salty soils, so we can spare land intended for agriculture. Right?

**Sultan** – Very good, little Science Jinn. And do you remember what they found out? Can we process plants that are rich in salt for the production of biofuels?

**Science Jinn** – For sure, Your Majesty. The smart scientists said that such plants must be physically or chemically pretreated to release long starchy sugar chains from the inner cell walls. These chains will be biologically processed to produce small sugar molecules. In a reactor, the molecules can be directly converted into biofuels. But there is a problem: Because there is high salt concentration in the reactor, corrosion must be prevented. This also means that the biocatalysts, which are either microbial enzymes or the microbes themselves, must withstand the high salt concentration.

**Sultan** – Did my four scientists suggest a possible solution in this regard?

**Science Jinn** – Your Majesty’s four scholars proposed to identify salt-loving microbes that thrive in the saltiest environments on our planet including the Great Salt Lake or the Dead Sea.

**Sultan** – I am proud of my four AGYA scientists who found such a smart solution! Could you explain to our readers, who or what is AGYA again?

**Science Jinn** – AGYA was established in 2013 as the first bilateral young academy worldwide. The Academy brings together Arab and German scholars from all disciplines to face shared challenges and develop solutions through research cooperation. Your Majesty can find information on all the AGYA members on [www.aga.info](http://www.aga.info).

**Sultan** – Let us now plan for the next AGYA Science Comic ...

IT IS MY TASK TO TRANSLATE THE LATEST SCIENTIFIC FINDINGS INTO WORDS THAT ARE EASILY UNDERSTOOD BY EVERYONE.



Download a digital version of this science comic on [www.aga.info](http://www.aga.info)